

find the last resistance value, R_g .

$$R_g = 182 \text{ k}\Omega \left(\frac{1.2\text{V}}{6\text{V}} \right) = R_{\text{FORM8}} \\ = 36.4 \text{ k}\Omega.$$

In Table 1, you match the rounded-off

calculated resistance value (Calculated R) to the nearest available fixed-resistor value (Fixed R) as shown in the last two columns. Note that R_g consists of two series-connected resistors. You can download the table of 1%-tolerance resistor values from EDN's Web site, www.edn

mag.com. Click on "Search Databases" and then enter the Software Center to download the .gif file for Design Idea #2654.

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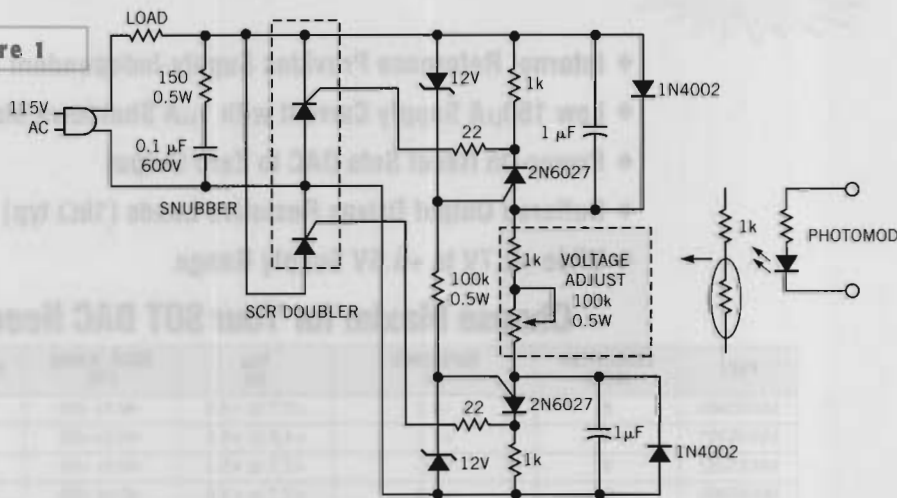
SCR phase control yields solid-state switch

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SCRs (SILICON-CONTROLLED rectifiers), or thyristors, have higher current and voltage ratings, lower conduction losses, and more robustness than triacs. For these reasons, SCR's are better suited to high-power applications. For example, you can use two SCR's to configure a 100 or 200A, 460V control circuit. Table 1 lists some of the advantages of SCR's over triacs. The main challenge is driving the SCR's: You now have two gates, rather than one, to drive. Furthermore, the gates are referenced to opposite polarities with a significant voltage difference. The circuit in Figure 1 solves the problem with two PUTs (programmable unijunction transistors), one connected to each SCR. Performance is good because the circuit does not "fold back" as inexpensive triac phase controls (dimmers) do. The PUT fires when the timing-capacitor voltage exceeds the PUT reference voltage by one diode drop and dumps the capacitor's charge into the SCR gate.

You adjust the phase delay by varying the charge rate of the capacitor via the potentiometer. You can enhance the balance by matching both the zener-diode voltages and the values of the charging capacitance. You

Figure 1



This SCR phase-control circuit uses one potentiometer and no pulse transformers.

can obtain 230V operation by using 1.5- to 2- μ F timing capacitors. You can achieve 460V-ac operation by using 1200V SCR's; 3- μ F timing capacitors; and

a 100-k Ω , 25W potentiometer. Using the circuit as a solid-state switch is practical; simply replace the voltage-adjust block in the broken lines in Figure 1 with a *photomod*.

A photomod is a unique type of photocoupler that has an LED or incandescent-light source and a cadmium-sulphide photocell. Unique properties of these photocells are their high dark resistance and high voltage ratings.

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TABLE 1—SCR-VERSUS-TRIAC COMPARISON

Device	SCR	Triac
Current rating	>>50A	<40A
Conduction voltage drop	~1V	~1.5V
Junction temperature	125°C	115°C
Thermal resistance	Low	Medium
Maximum voltage	1400V	600V
Surge current	High	Limited
Robustness	High	Low
Package	Doubler or "hockey puck"	1/4-in. stud
Isolation	Isolated	Nonisolated
Number required	Two	One